

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	NIELSEN ET AL.)	EXAMINER:	SZETO, JACK W
)		
SERIAL NUMBER:	10/719,180)	ART UNIT:	2113
)		
FILING DATE:	NOVEMBER 20, 2003)		
)		
TITLE:	HOST-INITIATED DATA)		
	RECONSTRUCTION FOR)		
	IMPROVED RAID READ)		
	OPERATIONS)		

Mail Stop:
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

AFFIDAVIT UNDER 37 C.F.R. SEC. 1.131

Dear Sir:

This affidavit is an Affidavit Under 35 U.S.C. Sec. 1.131. The undersigned co-inventor, Colleen R. Stouffer, was an employee of IBM Corporation ("IBM") at the time this patent application was filed and remains an employee of IBM. This patent application is assigned to IBM.

1. I hereby declare that at the time the present patent application was filed I was an employee of IBM in the United States and I remain an employee of IBM. My position with IBM at that time was Software Engineer. As such, my responsibilities included coding device adapter stage and destage error recovery procedures.

2. I further declare that as part of my responsibilities with IBM, I participated in the conception and reduction to practice of the invention described and claimed in the above-referenced patent application.

3. I further declare that the invention was conceived in the United States at least as early as October 6, 2002, as evidenced by the software change history for IBM's Enterprise Storage Server Model 800 (also known as "Shark") which I acknowledged on that date, attached hereto as Exhibit A. Confidential and irrelevant material has been removed from the software change history and replaced by ellipses. The note describes the problem (data lost when a drive fails to write but the drive does not indicate an error) and the solution (reconstruct the data). The invention was reduced to practice at least as early as January 3, 2003, as evidenced by the notation I added on that date ("Add support for reconstruct read") to the header to the implemented code, attached hereto as Exhibit B. Because the code itself is confidential, it has not been included in the exhibit. Arrows have been inserted in both exhibits to indicate relevant portions of the respective documents.

4. I therefore declare that the information disclosed in U.S. Patent Publication No. 2004/0268178 ("Fredin") is not 35 U.S.C. §102(b) or §103 prior art with respect to the claims of the present patent application since Fredin was filed on June 19, 2003, and the present patent application was conceived in the United States at least as early as October 6, 2002, and reduced to practice at least as early as January 9, 2003. Moreover, the filing data of the present application, November 20, 2003, was within a year of the filing date of Fredin.

Respectfully Submitted,

By: Colleen R. Stouffer
Colleen R. Stouffer

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1. I hereby declare that at the time the present patent application was filed I was an employee of IBM in the United States and I remain an employee of IBM. My position with IBM at that time was Senior Engineer. As such, my responsibilities included being one of the technical team leaders on the device adapter team working on IBM storage controllers, such as the Enterprise Storage Server Model 800 (ESS800, also known as "Shark"), with my main focus being the stage/destage part of the code, including the error recovery aspects, and the interface with the RAID controller for storing and retrieving data.

2. I further declare that as part of my responsibilities with IBM, I participated in the conception and reduction to practice of the invention described and claimed in the above-referenced patent application.

3. I further declare that the invention was conceived in the United States at least as early as October 6, 2002, as evidenced by the software change history for IBM's ESS 800 acknowledged on that date by co-inventor Colleen R. Stouffer, attached hereto as Exhibit A. Confidential and irrelevant material has been removed from the software change history and replaced by ellipses. The note describes the problem (data lost when a drive fails to write but the drive does not indicate an error) and the solution (reconstruct the data). The invention was reduced to practice at least as early as January 3, 2003, as evidenced by the notation added by Colleen R. Stouffer on that date ("Add support for reconstruct read") to the header to the implemented code, attached hereto as Exhibit B. Because the code itself is confidential, it has not been included in the exhibit. Arrows have been inserted in both exhibits to indicate relevant portions of the respective documents.

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Respectfully Submitted,

By: Karl A. Nielsen
Karl A. Nielsen

Date: 20 Sept. 2006

EXHIBIT A: CHANGE HISTORY (REDACTED)

prefix F
 name 45823
 reference BB00can3
 abstract DI: ADC hint0906 data corruption (DCR 29847)
 duplicate

state closed
 severity 2
 age 777

compName Microcode-da answer N/A
 release
 envName
 level

addDate 2001/01/05 19:50:09 assignDate 2002/10/03 11:07:45
 lastUpdate 2003/08/05 12:59:56 responseDate 2002/10/03 12:01:40
 endDate 2003/02/25 03:00:10

ownerLogin stouffer originLogin fredp
 ownerName Stouffer, Colleen R. originName Poole, Fred
 ownerArea 7XVA/2D originArea CYDA

remoteName remoteFamily
 target 2002/10/18
 product Shark1.1
 targetVrmf 2.1.2
 targetFunction
 targetPhaseDF
 ftdc
 systemAttach N/A
 processError
 activityODC Post-GA
 triggerODC N/A
 impactODC N/A
 defTypeODC N/A
 qualTypeODC N/A
 sourceODC N/A
 custProbabilit0
 customerImpact990
 TestDriver
 FieldOrigin US

FieldEscape

boxSerialNumbe

tracks:

releaseName	state	addDate	lastUpdate	target
R6g.CPSS	complete	2003/01/08	2003/02/24	2003/02/19

verify:

type	state	addDate	lastUpdate	userLogin	duplicate
duplicate	accept	2001/02/05	2003/02/25	fredp	46880
original	accept	2002/10/03	2003/02/25	fredp	45823

history:

addDate	action	userLogin (userName)
2001/01/05 19:50:09	open	fpoole (Poole, Fred)
2001/01/08 08:19:29	modify	bdclark (Clark, Brian D)
2001/01/08 08:20:20	assign	bdclark (Clark, Brian D)
2001/01/08 08:24:28	note	bdclark (Clark, Brian D)
2001/01/08 08:31:00	assign	garciare (Garcia, Raymond E.)
2001/01/08 10:25:30	note	shunting (Huntington, Steven)
2001/01/08 12:56:41	note	garciare (Garcia, Raymond E.)
2001/01/09 10:38:02	return	garciare (Garcia, Raymond E.)
2001/01/09 10:38:03	note	garciare (Garcia, Raymond E.)
2001/01/17 10:12:05	reopen	fpoole (Poole, Fred)
2001/01/17 11:00:56	assign	garciare (Garcia, Raymond E.)
2001/01/17 19:39:19	note	rschaef (Schaeffer, R.A. (Rick))
2001/01/22 14:16:15	note	fpoole (Poole, Fred)
2001/01/23 09:54:59	note	rschaef (Schaeffer, R.A. (Rick))
2001/01/25 08:20:08	note	fpoole (Poole, Fred)
2001/01/29 14:09:51	note	rschaef (Schaeffer, R.A. (Rick))
2001/01/29 17:47:46	note	rschaef (Schaeffer, R.A. (Rick))
2001/01/30 12:51:40	note	jarvis (Jarvis, Chip)
2001/02/02 08:46:23	note	ayreskj (Ayres, Kate)
2001/02/02 09:29:56	note	rschaef (Schaeffer, R.A. (Rick))
2001/02/05 11:00:50	assign	rschaef (Schaeffer, R.A. (Rick))
2001/02/06 08:49:55	note	ayreskj (Ayres, Kate)
2001/02/07 08:56:14	note	ayreskj (Ayres, Kate)
2001/02/07 12:05:08	note	nielsen (Nielsen, Karl)
2001/02/11 21:00:55	return	nielsen (Nielsen, Karl)
2001/02/14 10:34:52	modify	oubre (Oubre, Rich)
2001/02/16 11:54:30	reopen	nielsen (Nielsen, Karl)
2001/02/16 13:39:54	note	nielsen (Nielsen, Karl)
2001/02/16 13:40:57	modify	nielsen (Nielsen, Karl)
2001/02/27 12:14:57	modify	bdclark (Clark, Brian D)

2001/03/12 08:59:35	note	ayreskj (Ayres, Kate)
2001/03/12 10:41:31	note	nielsen (Nielsen, Karl)
2001/04/19 16:15:48	modify	nielsen (Nielsen, Karl)
2001/05/02 13:49:35	modify	ayreskj (Ayres, Kate)
2001/05/06 19:56:48	note	doublee (Yanes, Juan)
2001/05/07 14:43:23	assign	nielsen (Nielsen, Karl)
2001/05/07 16:06:21	modify	doublee (Yanes, Juan)
2001/05/08 07:52:39	modify	doublee (Yanes, Juan)
2001/07/13 12:14:46	note	nielsen (Nielsen, Karl)
2001/07/13 12:19:23	note	nielsen (Nielsen, Karl)
2001/08/05 12:03:28	modify	doublee (Yanes, Juan)
2001/08/21 07:05:30	modify	doublee (Yanes, Juan)
2001/11/13 06:12:42	modify	doublee (Yanes, Juan)
2001/11/27 04:15:47	modify	doublee (Yanes, Juan)
2001/12/15 01:17:59	modify	doublee (Yanes, Juan)
2002/02/19 06:01:11	modify	doublee (Yanes, Juan)
2002/03/22 10:01:37	modify	bergey (Bergey, Larry)
2002/06/04 13:09:42	modify	oubre (Oubre, Rich)
2002/09/24 19:18:48	modify	nielsen (Nielsen, Karl)
2002/09/30 09:46:06	modify	bergey (Bergey, Larry)
2002/10/03 09:57:52	assign	stouffer (Stouffer, Colleen R.)
2002/10/03 11:07:45	assign	stouffer (Stouffer, Colleen R.)
2002/10/03 11:08:09	modify	stouffer (Stouffer, Colleen R.)
2002/10/03 12:01:40	accept	stouffer (Stouffer, Colleen R.)
2002/10/06 14:06:31	note	stouffer (Stouffer, Colleen R.)
2002/10/06 14:23:34	note	stouffer (Stouffer, Colleen R.)
2002/10/07 06:29:08	note	hathorn (Hathorn, Roger)
2002/10/07 11:49:34	modify	stouffer (Stouffer, Colleen R.)
2002/10/13 13:40:36	modify	stouffer (Stouffer, Colleen R.)
2002/10/14 09:47:33	note	stouffer (Stouffer, Colleen R.)
2002/10/18 12:29:37	note	stouffer (Stouffer, Colleen R.)
2002/10/18 12:30:00	modify	stouffer (Stouffer, Colleen R.)
2003/01/08 09:01:40	note	stouffer (Stouffer, Colleen R.)
2003/01/08 13:52:31	note	jarvis (Jarvis, Chip)
2003/02/19 10:12:18	note	stouffer (Stouffer, Colleen R.)
2003/02/19 10:29:43	note	stouffer (Stouffer, Colleen R.)
2003/02/19 15:02:00	note	jarvis (Jarvis, Chip)
2003/02/24 14:13:13	note	jarvis (Jarvis, Chip)
2003/02/24 14:13:26	verify	jarvis (Jarvis, Chip)
2003/02/25 03:00:10	close	fredp (Poole, Fred)
2003/08/05 12:59:56	note	tgriffey (Griffey, Theresa)

←

...

<Note by stouffer (Stouffer, Colleen R.), 2002/10/06 14:23:33,
seq: 55 rel: 0 action: note>

←



Request Track Approval:

1. Problem Description:

There have been field incidents where customers have lost data because a drive in the array does not write the data and does not give an error. When the data is read, an LRC, CRC, PA or sequence number error is detected. This change will allow us to reconstruct the data using the other tracks and the parity track for RAID 5 and by reading the mirror for the RAID 10. Hursley has added a new function in DCR 29847 that allows us to specify how the data should be read.

2. Impact of Problem to Customer: 990 data loss

3. Frequency of Problem: Relatively infrequent by very serious when it occurs.

4. Fix Description: Using a special function in the adapter firmware, reconstruct the data for the failed track.

5. Is this a Design Change? yes for the adapter firmware

Is a Documentation update required? no

Enter PCR/FCR/DCR number if applicable. DCR 29847

6. What CMVC number and Link introduced this Problem? This is a drive problem that we are attempting to work around.

...

EXHIBIT B: CODE HEADER

```
/*-----  
** %PS  
**  
** IBM Confidential  
**  
** Licensed Internal Code Source Materials  
**  
** 2105/2107 Licensed Internal Code  
**  
** (C) Copyright IBM Corp. 1997, 2003  
**  
** The source code for this program is not published or otherwise  
** divested of its trade secrets, irrespective of what has been  
** deposited with the U.S. Copyright Office.  
** %EPS  
**  
** Filename: dasdsmederr.c  
**  
** Subsystem: DA  
**  
** Description:  
** This file contains the functions needed for performing Medium error  
** recovery.  
**  
** Function Names:  
** dasdsMedErrGetDumps  
** dasdsMedErr  
** dasdsMedErrBldStg  
** dasdsMedErrStgCmp  
** dasdsMedErrStgCmpSectors  
** dasdsMedErrStgCmpTrack  
** dasdsMedErrNextCdcdb  
** dasdsMedErrRecSec  
** dasdsMedErrRecSecCallback  
** dasdsMedErrChkStripeLRC  
** dasdsMedErrChkStripeLRCCallback  
** dasdsMedErrCheckLRCNoMeta  
** dasdsMedErrBldDestg  
** dasdsMedErrDestgCmp  
** dasdsMedErrChkLRCDone  
** dasdsMedErrFinish  
** dasdsMedErrFinishReconstructLog  
** dasdsMedErrSuccessFinishCmp  
** dasdsGetRecoveryResources
```

```

** dasdsMedErrSetupCDCBQueue
** dasdsMedErrSetupTCBForBldStage
** dasdsMedErrRestage
** dasdsDriveDumpCmplt
**

```

** Change History:

Modifier	Date	Change ID
Karl Nielsen	19-Jan-1997	
Created file.		
Karl Nielsen	13-Feb-1997	
Add code for increment 2		
Karl Nielsen	28-Feb-1997	
Updates from code review		
Vincent Hsu	20-Apr-97	1496
Change OS_PCI_WINDOW_ADDR_SETUP_CACHE Interface		
Karl Nielsen	06-May-1997	1555
Make the rank inaccessible if we get a medium error on write		
Karl Nielsen	05-Jun-1997	1365
Increment 3 intended function and code changes - sense data		
Mike Vageline	06-Aug-97	2440
Add name of anonymous union where needed		
Mike Vageline	13-Aug-97	2420
Set errorRecord.resetCause to DaErrorRecordType for dasdsCallERD(...)		
Karl Nielsen	04-Sep-97	2688
Changes to cdcb and cscb arrays for track buffers		
Karl Nielsen	03-Dec-97	4201
Need to initialize more of the DaReq.		
Karl Nielsen	10-Dec-97	4455
Add kill-strip support		
Karl Nielsen	11-Jan-98	4716
Make sure sector bitmaps are correct before building commands		
Karl Nielsen	09-Feb-98	5320
Allow DA_PARTIAL_COMMAND as a return from dasdsBldCmd		
Karl Nielsen	17-Feb-98	5609
Need Adapter Queue lock when calling dasdsCheckBridgeLRC		
Karl Nielsen	05-Mar-98	5962
Don't use any of the original pointers (TCB,CDCB,etc) for kill strip recovery. They are all NULL.		
Karl Nielsen	26-Feb-98	5834
Make interface with cache asynchronous. Use different resources for customer data and metadata. Partially unquiesce when appropriate.		
Gail Spear	11-Feb-98	10988
Convert rwstatus to a union status.rwstatus		
Karl Nielsen	07-Jan-99	14049
caSDRecoverSectorGetMetaAccess needs TCB ownership		

** Karl Nielsen 01-Feb-99 14755
 ** Be consistent with calls to caSDRecoverSectorGetMetaAccess on FB
 ** tracks. Also change DDR on destage to not check sequence numbers.
 ** Karl Nielsen 09-Mar-99 15682
 ** Changes from review
 ** Karl Nielsen 22-Mar-99 16833
 ** Changes from review - consolodate common code
 ** Add dasdsGetRecoveryResources
 ** Add dasdsMedErrSetupCDCBQueue
 ** Add dasdsMedErrSetupTCBForBldStage
 ** Karl Nielsen 03-May-99 18392
 ** Add PA check when destaging CKD data
 ** Karl Nielsen 09-Jun-99 20448
 ** Updates to the PA checks. New function caCheckTrackPADuringRecovery.
 ** Matt Kalos 20-Jun-99 20684
 ** Set dareq medium recovery flag before calling bldcmd/bldmeta.
 ** Karl Nielsen 05-Jul-99 21271
 ** Use correct enum type for return from caSDRecoverSectorGetMetaAccess.
 ** Set DA_REQUEST_FLAGS_MEDIUM_REPAIR correctly on destage.
 ** Karl Nielsen 16-Aug-99 21668
 ** Changes to not require meta access to check LRC before destage.
 ** Karl Nielsen 19-Aug-99 23647
 ** When finishing metadata repair, drive original daReq instead of
 ** queueing it on the rank pending queue.
 ** Karl Nielsen 08-Sep-99 24827
 ** Remove trace into recovery TCB for every failed stage. Trace just by
 ** track results.
 ** Karl Nielsen 30-Sep-99 20631
 ** Add error log to show which components were affected by the error.
 ** Karl Nielsen 02-Nov-99 27117
 ** Correct bitmap of affected components. Data does rotate as well as
 ** parity.
 ** Karl Nielsen 09-Dec-99 28558
 ** Use correct parameters when calling caSDRecoverSector for sequence
 ** number errors.
 ** Karl Nielsen 21-Mar-00 33327
 ** Set DA_REQUEST_FLAGS_MEDIUM_REPAIR before calling dasdsBldCmd.
 ** Karl Nielsen 15-May-00 32859
 ** Make dasdsMedErrFinish external
 ** Larry Bergey 02-Jun-00 28659
 ** Ask ErrRA to do warmstart (for trace) at the end of medium error recovery
 ** Karl Nielsen 24-Jan-01 43519
 ** Get adapter dump on Panic during Recovery if global bit is set
 ** Karl Nielsen 11-Jun-01 52637
 ** Change so that LRC errors, PA errors, and SeqNum errors found in
 ** this path also have ErrRa wait to warmstart until the end of

```

**      recovery.
**      Karl Nielsen      02-Aug-01      56278
**      Add CRC checking on CKD tracks.
**      Karl Nielsen      20-Aug-01      50831
**      Changes for RAID-10 - only do single track.
**      Anjul Mathur      17-Sept-2001    58761
**      Remap with R6g(drv20010908_int).
**      Kurt Lovrien      26-Mar-2002    66897
**      Put all DaReqs onto ssa adapter boundary
**      Rich Stelmach      23-Apr-02      69268
**      Change Panic flags to Control Flags
**      Colleen Stouffer   24-Jun-02      74591
**      Remove Bridge LRC support
**      Rich Stelmach      10-Jul-2002    73663
**      Update pointers for 64-bit processor
**      Colleen Stouffer   27-Aug-02      64936
**      REMAP: Clear DA_RW_FLAGS_CHECK_DATA_ON_STAGE flag before
**      redriving the original DaReq.
**      NOTE: According to ca, this flag is only set for
**      a single track (no other CDCBs in the chain).
**      Carlo Hyde        16-Sep-02      60748
**      ADD change to prevent excessive logging by only allowing logs when
**      bitmap is nonzero for function dasdsMedErrFinish
**      Colleen Stouffer   04-Dec-02      75684
**      Add check for cross cluster recovery in dasdsMedErrFinish
**      Carlo Hyde        11-Feb-03      77691
**      Remap Check LRC after repairing CRC on CKD tracks from R9e to
**      R6g
**      Colleen Stouffer   09-Jan-03      45823
**      Add support for reconstruct read. Undo 60748.
**      Colleen Stouffer   03-Mar-03      63715
**      Add call to get drive dumps for stage errors (PCR 2156)
**      Colleen Stouffer   16-Jun-03      79609
**      Reconstruct read with preserved metadata - PCR 2282
**      Colleen Stouffer   09-Jul-03      79609
**      Fix BEAM issues - uninitialized pointers
**      Paul Richards      22-Aug-03      85805
**      Convert all ER #includes from rs*.h to er*.h
**
**-----*/

```